HSR Health Services Research

DOI: 10.1111/1475-6773.12613
RESEARCH ARTICLE

Mandatory Statewide Medicaid Managed Care in Florida and Hospitalizations for Ambulatory Care Sensitive Conditions

Tianyan Hu and Karoline Mortensen

Objective. To investigate the impact of implementation of the Statewide Medicaid Managed Care (SMMC) program in Florida on access to and quality of primary care for Medicaid enrollees, measured by hospitalizations for ambulatory care sensitive conditions (ACSCs).

Data Sources. We examine inpatient data obtained from the Agency for Health Care Administration for 285 hospitals in Florida from January 2010 to June 2015. The analysis includes 3,645,515 discharges for Florida residents between the ages 18 and 64 with a primary payer of Medicaid or private insurance.

Study Design. We use a difference-in-differences approach, comparing the change in the incidence of ACSC-related inpatient visits among Medicaid patients before and after the implementation of SMMC, relative to the change among the privately insured.

Principal Findings. After implementation of SMMC, Medicaid patients experienced a 0.35 percentage point slower growth in overall ACSC-related inpatient visits, and a 0.21 percentage point slower growth in chronic ACSC-related inpatient visits. The effects were significant in counties with above median Medicaid managed care penetration rates.

Conclusions. Implementing mandatory managed care in Medicaid in Florida leads to slower growth in inpatient visits for conditions that can potentially be prevented with improved access to outpatient care.

Key Words. Medicaid managed care, preventable hospitalization, ambulatory care sensitive conditions, Prevention Quality Indicator

Pressure from rising health care spending and increasing enrollment from the expansion under the Affordable Care Act has generated significant interest in managed care in the joint federal-state Medicaid program. Medicaid managed care enrollment has increased from 15 percent in 1995 (Medicaid and CHIP

Payment and Access Commission [MACPAC] 2011) to 71 percent in 2013 (Kaiser Family Foundation 2016). Much of this growth is attributed to the Balanced Budget Act of 1997, which significantly expanded the authority of state Medicaid agencies to require managed care for most eligible Medicaid enrollees without a waiver (Schneider 1997). Programs must meet requirements on choice of plans and enrollment procedures, and establish standards for access and procedures for monitoring the quality and appropriateness of care (Holahan et al. 1998). Over half of the states sought bids from health plans to manage the health of their Medicaid enrollees in the past few years, seeking contracts totaling up to $60 billion (Iglehart 2011). States make the decision to adopt managed care with the hope that it will enhance access for enrollees, improve quality of care, and reduce program costs (Holahan et al. 1998).

The state of Florida has almost two decades worth of experience with Medicaid managed care in non-risk-based primary care case management via its MediPass program (Dubault, Petrella, and Loftis 2002) and a decade of experience with risk-based managed care (Alker and Hoadley 2013). Upon approval of its Section 1115 waiver in 2005, Florida began enrolling individuals in two demonstration counties (Broward and Duval) in 2006 into Medicaid managed care plans (the waiver was necessary as Florida sought to enroll more vulnerable populations) (Alker and Hoadley 2013). Studies demonstrate the pilot program led to significantly lower per member per month (PMPM) expenditure for enrollees with stable enrollment in the first 2 years after implementation (Harman et al. 2011) and slowed the increase in the PMPM expenditure in demonstration than nondemonstration counties in the long-term period (Harman et al. 2014).

The Florida legislature passed legislation in 2011 that mandated managed care in Medicaid via the Statewide Medicaid Managed Care (SMMC) program. The federal government approved the state's request in 2013, and the SMMC program was implemented between April and August 2014 (Centers for Medicare & Medicaid Services 2014). Enrollment is mandatory for most populations receiving full Medicaid benefits, including aged adults, disabled adults and children, low-income adults and children, dual eligible, and

---

Address correspondence to Karoline Mortensen, Ph.D., Department of Health Sector Management and Policy, School of Business Administration, University of Miami, 5250 University Drive, 417L Jenkins Building, Coral Gables, FL 33146; e-mail: kmortensen@bus.miami.edu. Tianyan Hu, Ph.D., is with the Robert Stempel College of Public Health and Social Work, Florida International University, Miami, FL.

children in foster care (Centers for Medicare & Medicaid Services 2014), but there are some exceptions.[1] The SMMC program allows participants to choose between a capitated managed care organization or a provider-sponsored network, with plans that cover all mandatory acute, primary and specialty services, and phases out MediPass, the non-risk-based managed care program (Centers for Medicare & Medicaid Services 2014). Eligible enrollees receive a letter with enrollment information and are auto-enrolled in a plan that most likely includes their primary care physician if they do not select a plan within 30 days (Alker and Hoadley 2013). The benefits in the private managed care plans are significantly more generous than those under fee-for-service. Additional benefits include waived copayments for all services, outpatient hospital services (in all plans but one), over-the-counter medication, supplies, and so on (Florida Agency for Health Care Administration 2015a). The Medicaid managed care penetration rate in Florida increased from 47 percent in 2013 (Florida Agency for Health Care Administration 2013) to 80 percent in December 2015 (Florida Agency for Health Care Administration 2015c). Most of the remaining individuals are not eligible for SMMC (Senior 2015). The state predicts the number will continue to increase and plateau to 85 percent in 2016 (Alker and Hoadley 2013; Duggan and Hayford 2013).

In this paper, we analyze the impact of the SMMC program on the incidence of inpatient visits related to ambulatory care sensitive conditions (ACSCs) among the Medicaid population in Florida. We compare the differential change in the incidence of ACSC-related hospital visits among Medicaid patients after the implementation of the SMMC program relative to the change among privately insured patients. ACSCs are conditions for which timely and effective outpatient care can help to reduce the risks of hospitalization by either preventing the onset of an illness or condition, controlling an acute episodic illness or condition, or managing a chronic disease or condition (Billings et al. 1993). The incidence of hospital visits related with ACSCs is an externally valid measure of access to care in the community (Ansari, Laditka, and Laditka 2006), and it is increasingly used as a measure of effectiveness of primary care (Purdy et al. 2009). Previous literature demonstrates that improved access to primary care is associated with fewer hospitalizations for ACSCs (Gadomski, Jenkins, and Nichols 1998; Gill and Mainous 1998; Falik et al. 2001; Backus et al. 2002; Basu, Friedman, and Burstin 2002; Zhan et al. 2004; Ansari, Laditka, and Laditka 2006).

It is important to understand and interpret the rate of hospital visits related to ACSCs and its changes over time, particularly in this environment of growth in penetration of managed care in Medicaid (Billings, Anderson, and Newman 1996). Medicaid managed care plans aim to provide enrollees with enhanced access to preventive and primary care (Porell 2001; Friedberg, Hussey, and Schneider 2010) to reduce the use of costly services such as inpatient care and emergency department visits, and thus control the cost of plans. There are a number of organizational features of HMOs that should enhance access to care for HMO enrollees, including an accountable primary care provider, a defined enrollee population, comprehensive coverage of services, information systems, and centralized resources (Porell 2001). A 10 percent increase in HMO penetration has been found to be associated with a 3.8 percent drop in ACSC hospitalizations in an analysis of 22 states (Zhan et al. 2004), and a 3.1 percent decrease among private managed care enrollees in California (Backus et al. 2002).

It is not clear that the benefits of managed care found in commercially insured managed care populations translate to improvements for Medicaid populations. The expansion of Medicaid managed care in Massachusetts led to a higher prevalence of ACSC hospitalizations among Medicaid HMO enrollees than fee-for-service enrollees (Porell 2001). Medicaid HMO patients were more likely to be hospitalized for ACSCs than Medicaid fee-for-service patients in Florida Medicaid in 2008 (Park and Lee 2014). On the other hand, mandatory Medicaid managed care in California was associated with a large reduction (33 percent) in hospitalization for ACSCs among managed care enrollees compared to fee-for-service enrollees (Bindman et al. 2005). Other studies have found no effect of Medicaid managed care enrollment with preventable hospitalization. Analysis of hospital discharge data from four states found that HMO enrollment was associated with fewer preventable admissions than marker admissions compared to fee-for-service enrollees for patients with private insurance, but no effects for Medicaid HMO enrollees compared to Medicaid fee-for-service were found (Basu, Friedman, and Burstin 2004).

This study extends the literature in several ways. First, we use data on a state with aggressive implementation of managed care in Medicaid. Second, we compare Medicaid enrollees to the privately insured in Florida to control for other factors occurring in the state during the implementation period. Finally, we control for Medicaid managed care penetration at the county level and stratify our analysis by counties that had lower and higher than median

penetration to assess the differences in outcomes in areas with more and less experience with managed care.

METHODS

Data

The primary source of the data was the most recent hospital discharge data from Quarter 1 of 2010 to Quarter 2 of 2015, maintained by the Florida Agency for Health Care Administration (AHCA). The hospital discharge data used in this analysis contain information on all inpatient visits from 285 hospitals in 67 counties in Florida. AHCA publishes a Medicaid monthly enrollment report, which we use to calculate the Medicaid managed care penetration rate in each county in each quarter (using the report in March, June, September, and December of each year), to measure the market structure of Medicaid managed care plans in each county. To create the analytic file, the measure was linked to the hospital discharge data using county indicators for hospitals and quarter variables.

The main outcome examined is a binary indicator for whether the discharge was for a preventable hospitalization, that is, whether the hospital visit was associated with an ACSC. We adopt the most recent Prevention Quality Indicator (PQIs) Version 5.0 developed by Agency for Healthcare Research and Quality (AHRQ) to create measures for the preventable hospitalizations (Agency for Healthcare Research and Quality 2015). PQIs identify a set of conditions that result in hospitalizations that can be prevented through access to primary care. We identify inpatient visits associated with ACSCs by applying algorithms of PQIs onto ICD-9-CM diagnosis and procedure codes in the hospital discharge data. Past studies have used this measure as the indicator of quality of care when evaluating the impact of Medicaid managed care policies or other policies that intend to improve primary care (Porell 2001; Basu, Friedman, and Burstin 2004; Zhan et al. 2004; Bindman et al. 2005; Zeng et al. 2006; Basu and Mobley 2007; Saha et al. 2007; Park and Lee 2014). We follow AHRQ methodology to generate three PQI composite measures, including the prevention quality overall composite of all the quality indicators (PQI 90), the prevention quality acute composite (PQI 91, which includes PQI #s 10, 11, and 12), and the prevention quality chronic composite (PQI 92, which includes PQI #s 1, 3, 5, 7, 8, and 13–16). We tabulate each of the individual PQIs as well as the composite PQIs to see how they vary by insurance status and pre-post implementation.

Statistical Analyses and Samples

We use a difference-in-differences (DD) model, which is increasingly being used in empirical research focusing on health care policy (Dimick and Ryan 2014), Medicaid (Mortensen 2010), and Medicaid managed care (Hu, Chou, and Deily 2015; Marton et al. 2016) to evaluate the research question. Specifically, we compare the change in the incidence of PQIs among Medicaid patients relative to the change among privately insured patients, assuming the trend for the privately insured patients reflects the secular trend in outcomes. A simple comparison of the incidence of PQIs for Medicaid managed care enrollees before and after the adoption of the program would yield a biased estimated effect. If the composition of Medicaid managed care enrollees changes (as would be expected with a 40 percentage point increase in enrollment over the expansion period), the estimated effect might be reflective of the composition change instead of the real impact of the policy. To address this potential bias, we perform an "intent to treat" analysis, where the Medicaid insured is the treatment group, and we compare the change in outcomes for Medicaid patients with the changes for privately insured patients.

The sample consists of 2,057,650 Medicaid and 1,587,865 privately insured patients who are Florida residents between ages 18 and 64, after dropping data from quarter 2 and 3 of 2014 when the implementation occurred, and dropping a small number of records with missing information on variables used in the analysis.

More formally, Equation (1) is estimated:

$$Y_{ijt} = \beta_0 + \beta_1 Medicaid_{ijt} \times Post_{jt} + \beta_2 Medicaid_{ijt} + Quarter_t + \gamma_{jt} + X_{ijt}\delta + \varepsilon_{ijt} \quad (1)$$

where Y_{ijt} measures PQIs (whether a hospital visit is associated with PQI 90, PQI 91 or PQI 92) for patient i in county j in quarter t; $Medicaid_{ijt}$ is an indicator that patient i in county j in quarter t is covered under Medicaid; $Post_{jt}$ is an indicator that equals one in the period after the SMMC program took effect; and X_{ijt} represents patient characteristics such as patients' age, gender, race/ethnicity (white non-Hispanic [reference group], black non-Hispanic, other race non-Hispanic, Hispanic), as well as the Elixhauser comorbidity index (reported as Elixhauser comorbidity sum is 0 [reference group], 1 indicates one comorbid condition and 2 indicates two or more) (Elixhauser et al. 1998). County-specific quarter linear trends (γ_{jt}) are included to control for county-specific trends that may be correlated with both SMMC adoption and outcomes and might otherwise bias the estimated effects of SMMC on outcomes.

Quarter fixed effects ($Quarter_t$) are used to control for state overall trends in PQIs.

The key explanatory variable in the Equation (1) is the interaction term, $Medicaid_{ijt} \times Post_{jt}$. We hypothesize that if the SMMC program improved access to primary care for Medicaid managed care enrollees in Florida, we would observe differential patterns of the incidence of PQIs among Medicaid managed care enrollees after the adoption of the program, compared with their privately insured counterparts.

As a robustness check, we include the interaction between Medicaid with the year indicators for years before the implementation of SMMC program, and estimate Equation (2):

$$\begin{aligned} Y_{ijt} = & \beta_0 + \beta_1 Medicaid_{ijt} \times Post_{jt} + \beta_2 Medicaid_{ijt} + Quarter_t + \gamma_{jt} + X_{ijt}\delta + \\ & \beta_3 Medicaid_{ijt} \times Year2011_j + \beta_4 Medicaid_{ijt} \times Year2012_j + \\ & \beta_5 Medicaid_{ijt} \times Year2013_j + \beta_6 Medicaid_{ijt} \times Year2014Q1_j + \varepsilon_{ijt} \end{aligned} \tag{2}$$

This is to test whether there is any difference in the trend of PQIs between Medicaid insured and privately insured patients in the preperiod, to make sure any significant results we observe from the main specification come from the policy effect, not any continuation of differences in the pretrend between two groups. We also stratify the sample according to county-level Medicaid managed care penetration rate in the preperiod (specifically, in 2013), to study the differential impact of the policy among counties with different level of market infrastructure for managed care plans.

All regressions are estimated by linear probability models to make interpretation of estimated coefficients on interaction terms straightforward. Huber–White-corrected standard errors are used to adjust for clustering at the county level. Statistical analyses were performed using Stata MP, version 14.1 (StataCorp 2015).

RESULTS

Table 1 shows summary statistics of patient characteristics of the Medicaid enrollees and privately insured group overall, in the preperiod and postperiod of the implementation of the SMMC program. Overall, privately insured patients tend to be older (44.27 vs. 37.47, $p < .001$), less likely to be female (0.64 vs. 0.73, $p < .001$), more likely to be white (0.66 vs. 0.42, $p < .001$), and

Table 1: Summary Statistics for Patient Characteristics Overall, before, and after the Implementation of the SMMC Program

	Privately Insured Sample			*Medicaid Sample*		
	Overall	*Pre-SMMC Period*	*Post-SMMC Period*	*Overall*	*Pre-SMMC Period*	*Post-SMMC Period*
Age	44.27 (13.26)	44.27 (13.23)	44.30 (13.38)	37.47 (13.80)	37.42 (13.80)	37.76 (13.76)
Female	0.64 (0.48)	0.64 (0.48)	0.63 (0.48)	0.73 (0.45)	0.73 (0.44)	0.72 (0.45)
White non-Hispanic (Reference Group)	0.66 (0.47)	0.66 (0.47)	0.63 (0.48)	0.42 (0.49)	0.42 (0.49)	0.41 (0.49)
Black non-Hispanic	0.14 (0.35)	0.14 (0.35)	0.15 (0.35)	0.29 (0.45)	0.29 (0.45)	0.29 (0.46)
Hispanic	0.14 (0.35)	0.14 (0.35)	0.16 (0.37)	0.25 (0.43)	0.25 (0.43)	0.25 (0.43)
Other races non-Hispanic	0.06 (0.23)	0.06 (0.23)	0.06 (0.24)	0.04 (0.20)	0.04 (0.20)	0.04 (0.21)
Elixhauser sum = 0 (Reference Group)	0.41 (0.49)	0.42 (0.49)	0.40 (0.49)	0.46 (0.50)	0.46 (0.50)	0.44 (0.50)
Elixhauser sum = 1	0.28 (0.45)	0.28 (0.45)	0.28 (0.45)	0.21 (0.41)	0.21 (0.41)	0.21 (0.41)
Elixhauser sum = 2	0.30 (0.46)	0.30 (0.46)	0.32 (0.47)	0.33 (0.47)	0.33 (0.47)	0.35 (0.48)
Number of observations	2,057,650	1,727,009	330,641	1,587,865	1,343,988	243,877

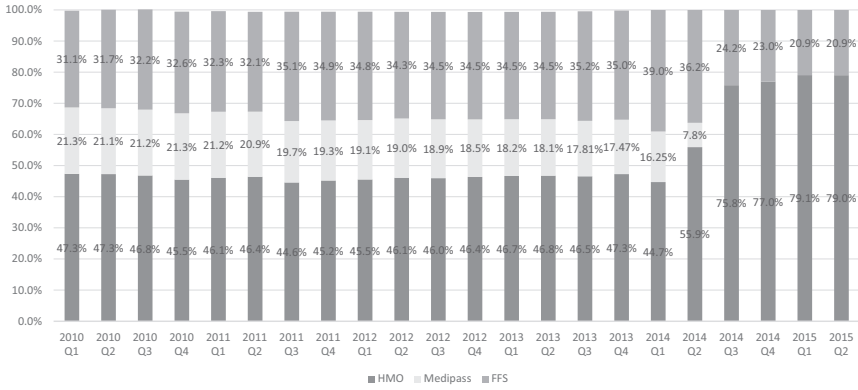
Notes. This table reports summary statistics of patient characteristics used in the analyses for the whole sample, for the period before the implementation of the Statewide Medicaid Managed Care (SMMC) program and after the implementation of the SMMC program, separately for Medicaid and privately insured patients. Standard deviations are in parentheses.

more likely to have only one chronic comorbidity (0.28 vs. 0.21, $p < .001$), compared with Medicaid insured patients. However, there were no economically significant differences in trends of those characteristics within each group before and after the implementation of the program. This ensures that comparison within Medicaid or privately insured group between pre- and postperiod would not yield any biased results from changes in the composition of each group, which would violate the parallel trends assumption that is central to DD analysis (Dimick and Ryan 2014).

The proportion of Medicaid managed care enrollees is relatively stable up until Quarter 1 of 2014, around 47 percent (Figure 1). This number sharply increases to 79 percent after Quarter 3 of 2014 after the statewide implementation of the SMMC program. The proportion of Medicaid fee-for-service enrollees decreases from around 35 percent to only around 21 percent, leaving only those who are not eligible for the SMMC program in those fee-for-service plans.

Table 2 shows summary statistics of individual PQIs that comprise the composite measures to see if any individual PQIs are influencing factors, as well as composite measures of PQIs used as outcomes. Overall, rates of the overall composite PQI and chronic composite PQI are greater among Medicaid patients compared to their privately insured counterparts (PQI90, 0.097

Figure 1: Percentage of Medicaid Managed Care Enrollment among Medicaid Enrollees



Notes: Author's calculation from Florida Statewide Medicaid Monthly Enrollment Report for various years. Acronyms include health maintenance organization (HMO), Medipass (the former non-risk-based managed care program in Florida, and fee-for-service (FFS).

Table 2: Summary Statistics for PQIs Overall, before, and after the Implementation of the SMMC Program

		Privately Insured Sample			*Medicaid Sample*		
PQI #	*PQI Name*	*Overall*	*Pre-SMMC Period*	*Post-SMMC Period*	*Overall*	*Pre-SMMC Period*	*Post-SMMC Period*
PQI #1	Diabetes, short-term complications	0.005 (0.070)	0.005 (0.069)	0.006 (0.078)	0.008 (0.087)	0.007 (0.085)	0.009 (0.096)
PQI #3	Diabetes, long-term complications	0.006 (0.079)	0.006 (0.078)	0.007 (0.085)	0.010 (0.100)	0.010 (0.099)	0.011 (0.103)
PQI #5	Chronic obstructive pulmonary disease	0.014 (0.118)	0.014 (0.118)	0.014 (0.118)	0.025 (0.157)	0.025 (0.157)	0.025 (0.158)
PQI #7	Hypertension	0.005 (0.074)	0.005 (0.073)	0.006 (0.076)	0.005 (0.073)	0.005 (0.074)	0.004 (0.067)
PQI #8	Heart failure	0.008 (0.088)	0.007 (0.086)	0.009 (0.094)	0.015 (0.122)	0.015 (0.121)	0.016 (0.127)
PQI #13	Angina without procedure	0.001 (0.035)	0.001 (0.035)	0.001 (0.033)	0.001 (0.028)	0.001 (0.028)	0.001 (0.026)
PQI #14	Uncontrolled diabetes	0.001 (0.039)	0.002 (0.040)	0.001 (0.036)	0.002 (0.050)	0.003 (0.051)	0.002 (0.046)
PQI #15	Asthma in younger adults	0.002 (0.043)	0.002 (0.044)	0.002 (0.043)	0.004 (0.062)	0.004 (0.062)	0.004 (0.061)
PQI #16	Lower extremity amputation	0.001 (0.024)	0.001 (0.024)	0.001 (0.026)	0.001 (0.033)	0.001 (0.033)	0.001 (0.035)
PQI #92	Prevention quality chronic composite	0.043 (0.203)	0.042 (0.202)	0.046 (0.210)	0.070 (0.256)	0.070 (0.256)	0.073 (0.260)
PQI #10	Dehydration	0.006 (0.080)	0.006 (0.080)	0.006 (0.077)	0.004 (0.067)	0.004 (0.067)	0.004 (0.064)
PQI #11	Bacterial pneumonia	0.012 (0.111)	0.013 (0.112)	0.011 (0.106)	0.012 (0.109)	0.012 (0.109)	0.010 (0.102)
PQI #12	Urinary tract infection	0.008 (0.089)	0.008 (0.089)	0.008 (0.090)	0.011 (0.103)	0.011 (0.103)	0.010 (0.101)
PQI #91	Prevention quality acute composite	0.027 (0.161)	0.027 (0.162)	0.025 (0.157)	0.027 (0.162)	0.027 (0.163)	0.025 (0.155)

continued

Table 2. *Continued*

		Privately Insured Sample			*Medicaid Sample*		
PQI #	*PQI Name*	*Overall*	*Pre-SMMC Period*	*Post-SMMC Period*	*Overall*	*Pre-SMMC Period*	*Post-SMMC Period*
PQI #90	Prevention quality overall composite	0.070 (0.255)	0.069 (0.254)	0.071 (0.258)	0.097 (0.297)	0.097 (0.297)	0.097 (0.297)
	Number of observations	2,057,650	1,727,009	330,641	1,587,865	1,343,988	243,877

Note. This table reports summary statistics of individual prevention quality indicators (PQIs), as well as three composite PQIs used in the analyses for the whole sample, for the period before the implementation of the SMMC program and after the implementation of the SMMC program, separately for Medicaid and privately insured patients. Standard deviations are in parentheses.

vs. 0.070, $p < .0001$; PQI92, 0.070 vs. 0.043, $p < .001$). Specifically, rate of overall composite PQI and rate of chronic composite PQI measures slightly increased among privately insured patients (0.069 vs. 0.071, $p < .001$; 0.042 vs. 0.046, $p < .0001$, respectively). For Medicaid patients, the rate of overall composite PQI does not significantly change between the pre- and postperiod (0.097 vs. 0.097, $p = .73$), while the rate of chronic composite PQI increases (0.070 vs. 0.073, $p < .001$). Rates of acute composite PQI decreases among both privately insured and Medicaid patients (0.027 vs. 0.025, $p < .001$; 0.027 vs. 0.025, $p < .001$, respectively).

After adjusting for patient characteristics, results of the DD specification in Table 3 indicate that Medicaid enrollees experience slower growth in the overall composite PQI, and chronic composite PQI, compared with their privately insured counterparts. Specifically, Medicaid patients experienced a 0.35 percentage point slower growth (which translates into a 3.6 percent effect) on the overall composite PQI, and a 0.21 percentage point slower growth (which translates into a 3.0 percent effect) on the chronic composite PQI. We also observe a 0.14 percentage point slower growth on the acute composite PQI for Medicaid patients, but it is not precisely estimated.

The significant results are robust to our sensitivity analyses. Falsification tests that include interaction terms between the Medicaid indicator and year indicators for the years in the preperiod are not significant, showing that there is no difference in patterns for the incidence of ACSC-related hospitalizations between Medicaid and private patients until the adoption of the SMMC program. We also observe only significant quality-improving results postimplementation among counties with above median Medicaid managed care penetration in the preperiod. We reestimated models using county*year fixed effects (results available upon request) and the results are consistent.

DISCUSSION

The study results show that, on average, Medicaid enrollees are more likely to experience ACSC-related hospitalization than the privately insured. However, after the implementation of SMMC in Florida, Medicaid patients experienced 3.0–3.6 percent relative reduction in the incidence of preventable hospitalizations, compared to the privately insured. It is only a modest effect compared to what we observed in the past literature. Improved access to primary and preventive care that the SMMC program provides to those eligible Medicaid enrollees likely played a role in these reductions. In addition to the

Table 3: The Effect of Statewide Medicaid Managed Care Program on Incidence of Preventable Hospitalization

	PQI 90 (Overall Composite PQI)				*PQI 91 (Acute Composite PQI)*				*PQI 92 (Chronic Composite PQI)*			
	Overall	*Overall*	*Counties above Median MMC Penetration Rate*	*Counties below Median MMC Penetration Rate*	*Overall*	*Overall*	*Counties above Median MMC Penetration Rate*	*Counties below Median MMC Penetration Rate*	*Overall*	*Overall*	*Counties above Median MMC Penetration Rate*	*Counties below Median MMC Penetration Rate*
Medicaid*	**−0.0035*** **	**−0.0045** **	**−0.0065** **	−0.0028	**−0.0014***	−0.0013	−0.0009	−0.0016	**−0.0021*** **	**−0.0032** **	**−0.0056** **	−0.0012
Post	**[0.0009]**	**[0.0017]**	**[0.0027]**	[0.0021]	**[0.0007]**	[0.0011]	[0.0014]	[0.0017]	**[0.0007]**	**[0.0013]**	**[0.0023]**	[0.0015]
Medicaid*		−0.0016	−0.0017	−0.0015		0.0001	0.0002	0.0001		−0.0017*	−0.0020	−0.0016
Year 2011		[0.0010	[0.0015]	[0.0013]		[0.0006]	[0.0010]	[0.0008]		[0.0009]	[0.0017]	[0.0010]
Medicaid*		0.0001	−0.0023	0.0021		0.0009	0.0008	0.0010		−0.0009	−0.0032	0.0011
Year 2012		[0.0022]	[0.0043]	[0.0018]		[0.0007]	[0.0008]	[0.0011]		[0.0018]	[0.0037]	[0.0012]
Medicaid*		−0.0023	−0.0017	−0.0030		−0.0002	0.0004	−0.0008		−0.0021	−0.0021	−0.0023*
Year 2013		[0.0019]	[0.0037]	[0.0018]		[0.0010]	[0.0012]	[0.0016]		[0.0015]	[0.0030]	[0.0013]
Medicaid*		−0.0018	−0.0007	−0.0029		−0.0010	0.0008	−0.0025*		−0.0008	−0.0014	−0.0004
Year 2014 (Q1)		[0.0021]	[0.0037]	[0.0022]		[0.0009]	[0.0014]	[0.0013]		[0.0012]	[0.0032]	[0.0016]
Observations	3,645,515	3,645,515	1,778,973	1,866,542	3,645,515	3,645,515	1,778,973	1,866,542	3,645,515	3,645,515	1,778,973	1,866,542

Notes. This table reports results of prevention quality indicators (PQIs) from estimation of Equations (1) and (2) using linear probability models. Control variables included but not listed consist of patients' age, gender, race/ethnicity (white non-Hispanic [reference group], black non-Hispanic, other race non-Hispanic, Hispanic), as well as the Elixhauser comorbidity index (reported as Elixhauser comorbidity sum is 0 [reference group], 1 is one comorbid condition, and 2 is two or more), county-specific linear trend, and quarter fixed effects. Standard errors in brackets are adjusted for clustering within hospital counties.
Boldface indicates statistical significance, ***$p < .01$; **$p < .05$; *$p < .1$.

expanded benefits under managed care, the state also requires the plans to provide care coordination; coordinate access to quality enhancements; maintain a region-wide network for providers offering an appropriate range of services in sufficient numbers; maintain a sufficient number, mix, and geographic distribution of providers, including those accepting new Medicaid patients; focus on health and disease management; and observe many other contingencies that were not necessarily provided under the fee-for-service program (Florida Agency for Health Care Administration 2015b). We performed a sensitivity analysis to examine whether this quality improving trend existed in the years before the implementation of the SMMC program and found that there was no preexisting differential trend of the outcomes between Medicaid and privately insured patients. The significant results come solely from the implementation of the mandatory Medicaid managed care program.

The results in our study are consistent with conclusions in a few studies that examined the impact of Medicaid managed care on the incidence of ACSC-related hospitalization (Bindman et al. 2005). However, there were several other studies that reached opposite conclusions. These conflicting results may arise because the Medicaid managed care program the study examined was in another state (Porell 2001; Basu, Friedman, and Burstin 2004), or the study used a different comparison group (Porell 2001; Basu, Friedman, and Burstin 2004; Park and Lee 2014). We focus on the mandatory Medicaid managed care program in Florida and compared the differential change in the outcome for Medicaid enrollees after the implementation of the program, relative to privately insured patients. This study design provides advantages over the previous literature. First, the mandatory nature of the SMMC program in Florida minimizes the selection bias issue. Eligible Medicaid beneficiaries are enrolled into the program quickly between May and August of 2014 county by county. They are not able to self-select themselves into fee-for-service or a managed care plan based on their own health status or preferences. Second, by using all Medicaid enrollees instead of only the Medicaid managed care enrollees as the treatment group, we avoid the bias introduced by the change in the patient mix.

We stratify the sample to explore the differential impact of the program on outcome in counties with more or less experience with Medicaid managed care, as measured by Medicaid managed care penetration rate in 2013, the year before implementation. The quality-improving effects are significant only in counties with above-median Medicaid managed care penetration rates, possibly due to the better managed care infrastructure and more experience with running managed care plans in those counties. This also suggests

that Medicaid managed care plans may produce more quality improvement in the long run through learning effects.

Our coefficients were only statistically significant for chronic PQI, which include conditions such as uncontrolled diabetes, asthma, and hypertension. Compared to conditions listed under acute PQI, these are conditions that require better medication management, frequent visits to a physician's office for prescriptions, and effective preventive care services. Managed care plans provide improved access to these types of primary and preventive care, which has the potential to significantly decrease the incidence of hospitalization due to these conditions.

Managed care in Medicaid provides a foundation for enrolling vulnerable populations and guaranteeing them a medical home, with the intention of providing states with some control and predictability over future costs as long as they could find plans willing to participate at affordable rates (Hurley and Somers 2003; Caswell and Long 2015). Spending on the Florida Medicaid program totaled over $23 billion in 2014, of which the state government contributed $9.5 billion, accounting for 20 percent of the state's budget (Chester 2015). Managed care payments in the state increased from 13 percent of Medicaid payments in fiscal year 2006 to a predicted 65 percent in fiscal year 2016 (Florida Agency for Health Care Administration 2015d). States have long recognized that managed care arrangements may not always be financially rewarding or produce major savings (Schneider 1997; Caswell and Long 2015), and they may actually increase spending (Duggan and Hayford 2013). In its first year of full implementation in 2015, the SMMC reduced the cost per member per month for enrollees compared to 2014 by slightly more than the 5 percent required under Florida statute (Sexton 2015). The vast majority of those savings will potentially be eliminated in the second year of the SMMC program, as Florida agreed in 2015 to increase payments to managed care organizations by an average of 7.7 percent, in response to lobbying by the Florida Association of Health Plans (Sexton 2015). Only a few months into their 5-year contracts, SMMC HMOs reported losses of $542.9 million through December 2014 and an additional $50 million through March 2015 (Chang 2015). Thus, it is vital for state government, managed care plans, and relevant stakeholders to keep monitoring the long run effect of the SMMC program on the cost and quality of health care services. Future research should explore ambulatory care and emergency department use to get a full understanding of the impacts of the program on health care use and access.

ACKNOWLEDGMENTS

Joint Acknowledgment/Disclosure Statement: The authors acknowledge support from their employers, the Florida International University and the University of Miami. They have no additional financial support or conflicts of interest to report. Findings from this study were presented at the AcademyHealth Annual Research Meeting in June 2016.

Disclosures: None.

Disclaimers: None.

NOTE

1. Women eligible for only family planning services, women eligible through the breast and cervical cancer services program, individuals eligible via emergency Medicaid, and children receiving pediatric extended care services are exempt from mandatory enrollment.

REFERENCES

Agency for Healthcare Research and Quality. 2015. "Prevention Quality Indicators Technical Specifications- Version 5.0." Prevention Quality Indicators [accessed on July 20, 2016]. Available at http://www.qualityindicators.ahrq.gov/modules/PQI_TechSpec.aspx

Alker, J., and J. Hoadley. 2013. "Medicaid Managed Care in Florida: Federal Waiver Approval and Implementation." Georgetown Health Policy Institute [accessed on March 29, 2016]. Available at http://ccf.georgetown.edu/wp-content/uploads/2013/10/Florida-Medicaid-Brief_Fall2013.pdf

Ansari, Z., J. N. Laditka, and S. B. Laditka. 2006. "Access to Health Care and Hospitalization for Ambulatory Care Sensitive Conditions." *Medical Care Research and Review* 63 (6): 719–41.

Backus, L., M. Moron, P. Bacchetti, L. C. Baker, and A. B. Bindman. 2002. "Effect of Managed Care on Preventable Hospitalization Rates in California." *Medical Care* 40 (4): 315–24.

Basu, J., B. Friedman, and H. Burstin. 2002. "Primary Care, HMO Enrollment, and Hospitalization for Ambulatory Care Sensitive Conditions: A New Approach." *Medical Care* 40 (12): 1260–9.

———. 2004. "Managed Care and Preventable Hospitalization among Medicaid Adults." *Health Services Research* 39 (3): 489–509.

Basu, J., and L. R. Mobley. 2007. "Do HMOs Reduce Preventable Hospitalizations for Medicare Beneficiaries?" *Medical Care Research and Review* 64 (5): 544–67.

Billings, J., G. M. Anderson, and L. S. Newman. 1996. "Recent Findings on Preventable Hospitalizations." *Health Affairs* 15 (3): 239–49.

Billings, J., L. Zeitel, J. Lukomnik, T. S. Carey, A. E. Blank, and L. Newman. 1993. "Impact of Socioeconomic Status on Hospital Use in New York City." *Health Affairs* 12 (1): 162–73.

Bindman, A. B., A. Chattopadhyay, D. H. Osmond, W. Huen, and P. Bacchetti. 2005. "The Impact of Medicaid Managed Care on Hospitalizations for Ambulatory Care Sensitive Conditions." *Health Services Research* 40 (1): 19–37.

Caswell, K. J., and S. K. Long. 2015. "The Expanding Role of Managed Care in the Medicaid Program: Implications for Health Care Access, Use, and Expenditures for Nonelderly Adults." *Inquiry* 52: 1–17.

Centers for Medicare & Medicaid Services. 2014. "Managed Care in Florida." [accessed on July 20, 2016]. Available at https://www.medicaid.gov/medicaid-chip-program-information/by-topics/delivery-systems/managed-care/downloads/florida-mcp.pdf

Chang, D. 2015. "Florida Says Privatizing Medicaid Cut Costs, But Insurers Say They're Underpaid by the State." *Miami Herald* [accessed on April 19, 2016]. Available at http://www.miamiherald.com/news/health-care/article27532903.html

Chester, A. 2015. "Florida's Medicaid Budget: Just the Facts." Georgetown Health Policy Institute blog [accessed on March 29, 2016]. Available at http://ccf.georgetown.edu/all/floridas-medicaid-budget-just-facts/

Dimick, J. B., and A. M. Ryan. 2014. "Methods for Evaluating Changes in Health Care Policy: The Difference-in-Differences Approach." *Journal of the American Medical Association* 312 (22): 2401–2.

Dubault, R., J. Petrella, and C. Loftis. 2002. "Evaluation of the Florida Medicaid MediPass Program" [accessed on July 20, 2016]. Available at http://fcmu.phhp.ufl.edu/research/focus/pdf/Report01-01-2002-EvalOfTheFlMedicaidMedipassProg.pdf

Duggan, M., and T. Hayford. 2013. "Has the Shift to Managed Care Reduced Medicaid Expenditures? Evidence from State and Local-Level Mandates." *Journal of Policy Analysis and Management* 32 (3): 505–35.

Elixhauser, A., C. Steiner, D. R. Harris, and R. M. Coffey. 1998. "Comorbidity Measures for Use with Administrative Data." *Medical Care* 36 (1): 8–27.

Falik, M., J. Needleman, B. L. Wells, and J. Korb. 2001. "Ambulatory Care Sensitive Hospitalizations and Emergency Visits: Experiences of Medicaid Patients Using Federally Qualified Health Centers." *Medical Care* 39 (6): 551–61.

Florida Agency for Health Care Administration. 2013. "Florida Statewide Medicaid Monthly Enrollment Report December 2013" [accessed on July 20, 2016]. Available at http://www.fdhc.state.fl.us/Medicaid/Finance/data_analytics/enrollment_report/docs/ENR_Dec2013.xls

Florida Agency for Health Care Administration. 2015a. "A Snapshot of the Florida Medicaid Managed Medical Assistance Program" [accessed on July 20, 2016]. Available at http://www.fdhc.state.fl.us/Medicaid/statewide_mc/pdf/mma/SMMC_MMA_Snapshot.pdf

Florida Agency for Health Care Administration. 2015b. "Core Contract Provisions" [accessed on July 20, 2016]. Available at http://www.fdhc.state.fl.us/medicaid/statewide_mc/pdf/Contracts/2015-11-01/Attachment_II-Core_Contract_Provisions_2015-11-01.pdf

Florida Agency for Health Care Administration. 2015c. "Florida Statewide Medicaid Monthly Enrollment Report December 2015" [accessed on July 20, 2016]. Available at http://www.fdhc.state.fl.us/medicaid/Finance/data_analytics/enrollment_report/docs/ENR_December_2015.xls

Florida Agency for Health Care Administration. 2015d. "Study of Hospital Funding and Payment Methodologies for Florida Medicaid" [accessed on July 20, 2016]. Available at http://ahca.myflorida.com/medicaid/medicaid_reform/lip/docs/FL_Medicaid_Funding_and_Payment_Study-2015-01-15.pdf

Friedberg, M. W., P. S. Hussey, and E. C. Schneider. 2010. "Primary Care: A Critical Review of the Evidence on Quality and Costs of Health Care." *Health Affairs* 29 (5): 766–72.

Gadomski, A., P. Jenkins, and M. Nichols. 1998. "Impact of a Medicaid Primary Care Provider and Preventive Care on Pediatric Hospitalization." *Pediatrics* 101 (3): E1.

Gill, J. M., and A. G. Mainous III. 1998. "The Role of Provider Continuity in Preventing Hospitalizations." *Archives of Family Medicine* 7 (4): 352–7.

Harman, J. S., C. H. Lemak, M. Al-Amin, A. G. Hall, and R. P. Duncan. 2011. "Changes in Per Member Per Month Expenditures after Implementation of Florida's Medicaid Reform Demonstration." *Health Services Research* 46 (3): 787–804.

Harman, J. S., A. G. Hall, C. H. Lemak, and R. P. Duncan. 2014. "Do Provider Service Networks Result in Lower Expenditures Compared with HMOs or Primary Care Case Management in Florida's Medicaid Program?" *Health Services Research* 49 (3): 858–77.

Holahan, J., S. Zuckerman, A. Evans, and S. Rangarajan. 1998. "Medicaid Managed Care in Thirteen States." *Health Affairs* 17 (3): 43–63.

Hu, T., S.-Y. Chou, and M. E. Deily. 2015. "Pregnancy Outcomes for Medicaid Patients in Mandatory Managed Care: The Pennsylvania HealthChoices Program." *Southern Economic Journal* 82 (1): 100–21.

Hurley, R. E., and S. A. Somers. 2003. "Medicaid and Managed Care: A Lasting Relationship?" *Health Affairs* 22 (1): 77–88.

Iglehart, J. K. 2011. "Desperately Seeking Savings: States Shift More Medicaid Enrollees to Managed Care." *Health Affairs* 30 (9): 1627–9.

Kaiser Family Foundation. 2016. "Total Medicaid Managed Care Enrollment." State Health Facts [accessed on July 20, 2016]. Available at http://kff.org/medicaid/state-indicator/total-medicaid-mc-enrollment/

Marton, J., A. Yelowitz, M. Shores, and J. C. Talbert. 2016. "Does Medicaid Managed Care Help Equalize Racial and Ethnic Disparities in Utilization?" *Health Services Research* 51 (3): 872–91.

Medicaid and CHIP Payment and Access Commission [MACPAC]. 2011. "Context and Overview of Medicaid Managed Care." Washington, DC [accessed on July

20, 2016]. Available at https://www.macpac.gov/publication/section-a-context-and-overview-of-medicaid-managed-care/

Mortensen, K. 2010. "Copayments Did Not Reduce Medicaid Enrollees' Nonemergency Use of Emergency Departments." *Health Affairs* 29 (9): 1643–50.

Park, J., and K.-H. Lee. 2014. "The Association between Managed Care Enrollments and Potentially Preventable Hospitalization among Adult Medicaid Recipients in Florida." *BMC Health Services Research* 14 (1): 247.

Porell, F. W. 2001. "A Comparison of Ambulatory Care-Sensitive Hospital Discharge Rates for Medicaid HMO Enrollees and Nonenrollees." *Medical Care Research and Review* 58 (4): 404–9.

Purdy, S., T. Griffin, C. Salisbury, and D. Sharp. 2009. "Ambulatory Care Sensitive Conditions: Terminology and Disease Coding Need to Be More Specific to Aid Policy Makers and Clinicians." *Public Health* 123 (2): 169–73.

Saha, S., R. Solotaroff, A. Oster, and A. B. Bindman. 2007. "Are Preventable Hospitalizations Sensitive to Changes in Access to Primary Care?" *Medical Care* 45 (8): 712–9.

Schneider, A. 1997. "Overview of Medicaid Managed Care Provisions in the Balanced Budget Act of 1997" [accessed on July 20, 2016]. Available at http://kff.org/medicaid/report/overview-of-medicaid-managed-care-provisions-in/

Senior, J. M. 2015. "Florida Medicaid" [accessed on July 20, 2016]. Available at https://ahca.myflorida.com/medicaid/recent_presentations/Florida_Medicaid_to_Senate_HHS_Appropriations_2015-10-20.pdf

Sexton, C. 2015. *AHCA Settles on 7.7 Percent Rate Hike for HMOs.* Tallahassee, FL: Politico Florida.

StataCorp. 2015. "Stata" [accessed on July 20, 2016]. Available at http://www.stata.com/

Zeng, F., J. F. O'Leary, E. M. Sloss, M. S. Lopez, N. Dhanani, and G. Melnick. 2006. "The Effect of Medicare Health Maintenance Organizations on Hospitalization Rates for Ambulatory Care-Sensitive Conditions." *Medical Care* 44 (10): 900–7.

Zhan, C., M. R. Miller, H. Wong, and G. S. Meyer. 2004. "The Effects of HMO Penetration on Preventable Hospitalizations." *Health Services Research* 39 (2): 345–61.

Supporting Information

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.